CLAIMS

- 1 1. A method for managing data to be written to a file served by a storage system
- while the file is undergoing a write allocation procedure, the method comprising the steps
- 3 of:
- receiving a write operation comprising data to be written to the file;
- associating the received data with a buffer data control structure associated with
- 6 the file; and
- marking the buffer data control structure associated with the file as being dirty for
- a next consistency point.
- 1 2. The method of claim 1 wherein the buffer data control structure comprises a first
- data pointer and a second data pointer.
- 1 3. The method of claim 1 wherein the step of associating the received data with the
- buffer data control structure further comprises a step of setting a pointer in the buffer data
- control structure to a memory location associated with the received data.
- The method of claim 1 wherein the step of marking the buffer data control struc-
- ture associated with the file as being dirty for a next consistency point comprises the step
- of setting a flag in a flags array of the buffer data control structure.
- 5. The method of claim 1 wherein the buffer data control structure comprises a flags
- array, the flags array having entries associated with a current consistency point and with a
- 3 next consistency point.
- 1 6. The method of claim 5 wherein entries associated with a current consistency point
- are accessed by indexing into the flags array using a value calculated by performing a
- logical AND operation on a consistency point counter and a value of 1.

- 7. The method of claim 6 wherein the consistency point counter is monotonically
- 2 increasing value that identifies a current consistency point.
- 1 8. The method of claim 5 wherein entries associated with a next consistency point
- are accessed by indexing into the flags array using a value calculated by subtracting from
- a value of 1 a result of performing a logical AND operation on a consistency point coun-
- 4 ter and a value of 1.
- 1 9. The method of claim 8 wherein the consistency point counter is a monotonically
- 2 increasing value that identifies a current consistency point.
- 1 10. The method of claim 5 wherein entries associated with the current consistency
- point and the next consistency point are differentiated by performing modulo two addi-
- 3 tion to a consistency point counter.
- 1 11. The method of claim 10 wherein the consistency point counter is monotonically
- 2 increasing.
- 1 12. A storage system for using a networked environment capable of accepting write
- operations directed to files currently undergoing a write allocation procedure, the storage
- 3 system comprising:
- means for receiving write operations containing data directed to the file;
- means for associating the received data with a buffer data control structure; and
- means for marking the buffer data control structure as being dirty for a next con-
- 7 sistency point.
- 1 13. The storage system of claim 12 wherein the means for associating the received
- data with a buffer data control structure comprises means for setting a pointer in the
- 3 buffer data control structure.

- 1 14. The storage system of claim 10 wherein a second pointer in the buffer data control
- structure points to data already written to the file.
- 1 15. A storage system adapted to enable write operations to a file undergoing write
- allocation, the storage system comprising:
- a write allocation process of a file system, the write allocation process adapted to
- associated received file data with a buffer data control structure upon receipt of a write
- operation directed to the file while the file is undergoing write allocation.
- 1 16. The storage system of claim 15 wherein the buffer data control structure com-
- prises a flags array having an entry associated with a current consistency pint and an en-
- 3 try associated with a next consistency point.
- 1 17. The storage system of claim 16 wherein the entry associated with the current con-
- sistency point is identified by performing addition modulo addition to a consistency point
- 3 counter.
- 1 18. The storage system of claim 16 wherein the entry associated with the next con-
- sistency point counter is identified by performing addition modulo two to a consistency
- 3 point counter.
- 1 19. The storage system of claim 16 wherein the entry associated with the current con-
- sistency point is accessed using an index value calculated by performing a logical AND
- operation on a consistency point counter and a value of 1.
- 20. The storage system of claim 16 wherein the entry associated with the next con-
- sistency point is accessed using an index value calculated by subtracting from a value of

- of 1 a result of performing a logical AND operation on a consistency point counter and a
- 4 value of 1.
- 1 21. A method for managing data to be written to a file while the file is undergoing a
- write allocation procedure, the method comprising the steps of:
- determining if the buffer is dirty for a current consistency point;
- performing, in response to determining that the buffer is dirty for the current con-
- sistency point, write allocation of a buffer associated with the file for a current consis-
- 6 tency point; and
- freeing, if the buffer is dirty for a next consistency point, data written during the
- 8 step of write allocation.
- 1 22. The method of claim 21 wherein the step of determining if the buffer is dirty for a
- 2 current consistency point further comprises the step of examining a flag in a buffer data
- 3 control structure associated with the buffer.
- 1 23. The method of claim 22 wherein the flag is an entry in a flags array storing entries
- for the next consistency point and the current consistency point.
- 1 24. The method of claim 23 wherein the entry for the next consistency point is identi-
- fied by performing addition modulo two to a consistency point counter.
- 1 25. The method of claim 23 wherein the entry for the current consistency point is
- identified by performing addition modulo two to a consistency point counter.
- 1 26. The method of claim 21 further comprising the step of increasing a consistency point
- 2 counter.

- 27. A buffer data control structure for use in a storage operating system permitting
- write operations to files undergoing a write allocation procedure, the buffer data control
- 3 structure comprising:
- a flags array having entries for flags associated with a current consistency point
- and entries associated with a next consistency point;
- a first data pointer pointing to file data associated with the current consistency
- 7 point; and
- a second data pointer pointing to file data associated with the next consistency
- 9 point.
- 1 28. The buffer data control structure of claim 27 wherein the flags associated with a
- 2 current consistency point are identified by performing addition modulo two to a consis-
- 3 tency point counter.
- 1 29. The buffer data control structure of claim 27 wherein the flags associated with the
- 2 next consistency point are identified by performing addition modulo two to a consistency
- 3 point counter.